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Discussions on Papers Presented to Congress.

No. 3.—The Mineral Requirements of Farm Animals.

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Mr. A. W. Noel Pillers (Liverpool) presided at the sitting on Thursday forenoon, September 5th, when there was a discussion on "The Mineral Requirements of Farm Animals."

Dr. J. B. Orr, when invited by the Chairman to supplement his paper with a few remarks, said: During the last few years the relationship of diet to disease has received an increasing amount of attention in both human and veterinary medicine. It is now definitely established that there are certain diseases which are produced, not by the presence of a positive toxic agent, but by the absence of some essential food constituent. There is also a good deal of evidence in favour of the view that, even in the case of some diseases due to the invasion of micro-organisms, the state of nutrition of the host, determined by its diet, is an important factor in determining the degree of susceptibility. The relatively high rate of growth and production in modern farm animals increases the importance of this aspect of preventive medicine. The more rapid the rate of growth or of the production of material of relatively constant composition, such as milk or eggs, the greater is the chance that there may be an insufficiency of some essential constituent of the diet, with the resultant appearance of definite deficiency diseases, and a weakening of what has been loosely termed "the constitution" of the animal, rendering it more susceptible to certain infectious diseases.

The classical schemes of rationing are confined to calories or starch values and protein ratios. It is in connection with substances, some of which are only required in minute amounts, that the main research work in nutrition is at present being done. Of the non-energy-yielding constituents, those required in largest amounts are calcium and phosphorus. They not only form the main elements in the skeletal structures, but are present as essential components of every living cell. Pigs on a diet deficient in calcium develop symptoms closely resembling tetany in children, a condition in which the blood calcium has been shown to be definitely below normal. Deficiency of either calcium or phosphorus in the food of young animals results in slow growth, imperfect bone formation, nervous symptoms, and generally impaired health. In the adult, deficiency of calcium may cause low milk yield, unthrifty condition, and lowered breeding capacity, the cows either failing to breed or giving birth to weak or dead calves. Deficiency of phosphorus will also cause low milk yield, and this constitutes a problem of great practical importance in certain parts of the Empire where phosphorus is deficient in the pastures. There is also reason to believe that deficiency of minerals in the food causes increased susceptibility to certain infectious diseases. The evidence which could be brought forward in support of the hypothesis that deficiencies of calcium and phosphorus in the food lead to decreased resistance to certain diseases, is much too meagre to enable us to draw any conclusions. It is sufficient, however, to stimulate further investigation. If it be shown that diet plays a part in affecting the resistance to certain common infectious diseases, there is obviously there a field of investigation of enormous importance in both human and veterinary preventive medicine. So far, the most enlightening work on this subject has been done, not in schools of human medicine, but in connection with farm animals. Veterinary medicine, apart from the deplorable lack of funds for research, is in a much better position to explore this field than is human medicine, and the field of observation is much wider. The ideal combination for research would be team work between the veterinary clinicians and the physiologists; and it is from such combined effort that our knowledge of this subject is likely to be increased in the next few years.

Professor J. Russell Greig (Edinburgh): When I was invited to open the discussion on Dr. Orr's paper I accepted with some trepidation. The title, "The Mineral Requirements of Farm Animals," suggested that the paper might be written on technical lines and might deal exclusively with matters within the sphere of Dietetics, a subject of which I can claim no specialised knowledge.

Instead, and I feel very wisely, Dr. Orr has chosen to write on general lines, and has dealt with mineral requirements principally in relation to animal disease.

The more full a man's knowledge of his subject, the more simply he can expound it, and the lucidity, the clarity of this paper is a reflex of the author's standing as an authority.

Of the minerals requisite to the maintenance of health Dr. Orr has emphasised the importance of calcium and phosphorus. I propose to deal with calcium rather than phosphate deficiency, but since the metabolism of both is so closely bound, my references to calcium deficiency in relation to disease will probably largely apply to phosphorus also.

Although it has long been recognised that certain diseases of a chronic nature, *e.g.*, rickets and osteomalacia, were associated with a calcium-phosphate deficiency, it is only in comparatively recent years that it became recognised that a sufficiency of calcium in the soft tissues was vital to the well-being of the organism.

The work of McCallum and Voegtlin (1909) which showed that partial or complete removal of the parathyroid glands was followed by a marked fall in the blood calcium and a train of symptoms which ultimately terminated in death,

focussed attention upon this *vital* quality of calcium and incidentally furnished evidence that its concentration in the tissues is largely under endocrine control.

The significance of calcium as an element essential to life may be seen not only in the constancy of its concentration in animals of widely different nature (fishes, amphibians, reptiles, birds and mammals all have a concentration of about 10 mgs. per cent.), but also in the singular constancy of the calcium level in any given individual. I believe that no constituent of the normal blood presents less variation than does calcium.

To maintain such an element at a constant level very delicate mechanisms must be at work.

Let us consider very briefly the known functions of calcium in the body.

1. Calcium is essential to the clotting of blood and the clotting of milk in the stomachs of suckling young. These, while functions of great importance, are of little concern to us here.
2. Perhaps the most obvious function is the formation and maintenance of bone, and indeed the skeleton constitutes the great reserve of calcium in the body.
3. But while calcium is perhaps most obvious to us as a constituent of bone, it is present in every normal cell, and further, its presence at a constant concentration is necessary to the normal functioning of every cell in the body. Experiments on isolated tissues of the most diverse kinds show that any variation in the calcium content of the perfusion fluid profoundly affects their function. A fall of calcium to half its normal value is sufficient to account for most marked effects.

We know that the maintenance of a definite osmotic pressure is necessary to the continuance of normal cell life, but besides the essential rôle of calcium in the maintenance of isotonicity, the calcium ions of the tissues form part of a complex system of balanced ions, which, under the control of the most delicate compensatory mechanisms, are maintained in physiological equilibrium. Any factor which is capable of producing a sudden reduction of the proportion of calcium ions would effect a sudden upset in the ionic balance. Under ordinary conditions, we have reason to believe, this would be immediately controlled, since the maintenance of the ionic balance is a vital necessity. The calcium deficiency would be rapidly made good by its mobilisation from the skeletal reserves. We do not precisely know how this is effected, but the secretion of the parathyroid glands would seem to possess the remarkable property of rapidly converting the deposited calcium of bone into a form readily available to the needs of soft living cells.

When Dr. Orr refers to the part calcium plays as a detoxicator he touches upon that aspect of the matter which most interests us as veterinarians.

From the evidence that is now accumulating there appears to emerge the fact that calcium is a factor of prime importance in the defence of the organism against toxins of both endogenous and exogenous origin.

Now there are several factors which are capable of causing calcium deficiency in the tissues. Some of these produce acute effects, which, if not too severe, may be of a transient nature.

Thus, the reaction of the blood can profoundly influence the availability of calcium.

Shortly, it may be said that if the reaction of the blood be markedly swung to the side of alkalinity the calcium is rendered much less available to the tissues.

Thus, the "stiffness" of racehorses may be taken as an example. After the severe exertion of a prolonged gallop powerful respiratory efforts occur; the lungs become "over-ventilated," the residual carbonic acid is washed out, and a temporary alkalosis is established, the calcium is rendered non-available and a transient tetany or "stiffness" results.

Probably a similar condition is that seen associated with severe and persistent vomiting in dogs; here the gastric hydrochloric acid is removed, the blood attempts to make good the lost acid and alkalosis results.

Well, these conditions are examples of acute *relative* deficiencies. The blood calcium may be present in normal amount, but in a less soluble, therefore less ionisable and less available form. On the other hand, the blood calcium concentration may be suddenly reduced by *absolute* removal.

In milk fever in cows and lambing sickness in ewes we have diseases in which the fall of blood calcium is enormous—the fall of calcium in these conditions is more acute and more profound than in any other known calcium deficiency.

It has been known for some years that milk fever was constantly associated with an acute calcium deficiency, but that association might have been no more than an association. The evidence is now such that one feels justified in stating that milk fever is no longer a mystery. It may now be accepted that the essential nature of the disease is an acute calcium, calcium-phosphate deficiency.

What can be the meaning of this sudden calcium drop? We have yet no precise information, but we believe that we are on sound ground in seeking to explain the phenomenon in the sudden loss of calcium in the milk. Half a gallon of colostrum contains as much calcium as is present in the whole blood of the body; that means that in, say, a two-gallon lactation, the blood calcium has to be replenished four times from the reserves. Unless the mobilising mechanism, the parathyroid, be in full activation this cannot be accomplished, the calcium cannot be withdrawn quickly enough from the bones and an acute deficiency results in the tissues.

Mammary inflation prevents further calcium exchanges from blood to milk.

Another condition which appears to represent an absolute calcium deficiency is transit tetany in mares, which Montgomerie and his co-workers at Bangor have recently investigated.

Disease of the parathyroid glands can in itself produce calcium deficiency in the tissues, but, so far as we know, such a condition is very rare in animals.

Besides the parathyroid secretion, another factor of enormous importance in the control of calcium metabolism is found in vitamin D.

Vitamin D causes an increase in the tissue calcium either by favourably influencing absorption and/or, what seems more probable, by increasing its retention by the tissues (fixing it in the tissues).

In recent experiments devised to investigate the possibilities of vitamin D as a therapeutic agent in cattle practice, experiments in which I had the co-operation of Mr. Kendrick, of Tarvin, I found that by administering vitamin D to a cow her blood calcium content could be enormously influenced.

The absence of vitamin D is undoubtedly a factor of very real importance in the matter of calcium deficiency.

And now I come to that aspect of the question which most concerns us here, a deficiency of calcium in the food. As has been indicated, a temporary deficiency of calcium in the food is of little moment, since the animal can quickly mobilise the requisite calcium from its own bone reserves, provided always its mobilisation apparatus, the parathyroids, is efficient, but the continued and prolonged deprivation of calcium is another matter.

There is a sufficiency of experimental evidence to show that a diet deficient in calcium leads to a withdrawal of calcium salts from bone, but, so far as I am aware, apart from the unpublished work of Morton, to which Dr. Orr refers, there is no direct evidence that a calcium deficient diet can markedly alter the calcium concentration in soft tissues. The question awaits investigation.

My attention was lately drawn to the matter when determining the blood calcium values of normal sheep used in controlling my lambing sickness experiments.

In a certain group, the blood calcium was abnormally low and on enquiry I found that these sheep had been browsed on lime-free experimental plots.

In a certain pasture, which I know to be markedly deficient in lime, an examination of a limited number of normal sheep showed remarkably low calcium values (although the results were not constant). My attention has been drawn to the low incidence of milk fever in calcareous districts and the high incidence of milk fever on acid soils, but it is possible that exceptions are to be found to these observations, and the evidence is, in point of fact, so meagre as to be valueless, except as suggesting an important line of enquiry.

But in any case, whether a calcium deficient diet is or is not capable of directly producing acute hypo-calcæmia with or without manifestations, there is no doubt that apart from its effects on growth and productivity such a deficient diet can lead to disease.

The recent work of Lamson, Minot and Robins is of great interest in this connection.

They found that when dogs were given massive doses of carbon tetrachloride a central necrosis of the liver was produced, but no clinical symptoms were evident and the dogs appeared healthy, provided there was an adequate supply of calcium in the diet. It was found that doses of as much as 250 c.c. could be tolerated without apparent ill effect. But if the animal were placed on a calcium-free diet relatively small doses rapidly produced serious symptoms of poisoning. Further, these symptoms could be rapidly relieved by the injection of calcium salts.

The liver is, of course, the site of the destruction of toxic metabolites and it is conceivable that any agent which is capable of causing injury to the liver cells will interfere with their powers of detoxication. The rôle of calcium in this process of detoxication is obscure, but its importance is obvious enough. It is conceivable that the unaccountable deaths in sheep following the administration of carbon tetrachloride for liver fluke may be associated with calcium deficiency.

In this connection, too, I have been struck with resemblances in the pathology of certain cumulative plant poisonings (notably those of bracken and ragwort) with hypocalcæmia, and I hope, when opportunity arises, to investigate these conditions from this point of view.

During the past year I have examined the calcium values in large numbers of diseased conditions in cattle and sheep. In no case was there found an acute calcium deficiency such as occurs in milk fever and its allied conditions, and in many conditions of disease the calcium concentration of the blood appeared to be undisturbed; but in a number of diseases, such as advanced tuberculosis, contagious abortion, severe septic infections, Johne's disease, advanced cases of scrapie in sheep, the calcium value was distinctly low. In simple post-parturient paralysis in the cow a low calcium concentration was also found.

We must avoid the old solecism, "*Post hoc, ergo propter hoc*," and are not to suppose that because a calcium deficiency is associated with a diseased condition it plays a part in the causation of that disease. It might represent the *effect* and not the *cause* of the disease; but these findings are, I think, suggestive, in view of the fact that we are now beginning to comprehend in calcium an agent of prime importance among the great defensive mechanisms of the animal body.

I was interested in an observation of Major Douglas in connection with tuberculosis. He has observed that in certain districts in this county the incidence of tuberculosis in dairy cows is much higher than in other districts. The difference in incidence in these various districts has obtained over a number of years and it is to be remembered that very large numbers of cows are dealt with, so the chance of coincidence appears to be minimised. The difference of incidence exists for no apparent reason except that of geological surface formation. This seems to be an observation well worth following up.

In a recent Presidential Address to the Fourth Science Congress of the New Zealand Institute, an interesting statement occurs by B. C. Aston. He says, "One cannot but be struck with the fact, even in New Zealand, that in travelling across unsettled country the limestone areas stand out prominently from the abundance of wild herbivores these areas support, compared with adjacent non-calcareous types of country. The great value of an abundance of calcium in the food supply of domestic stock is seen in the wonderful effect it has on the health and fecundity of the animal."

This question of relationship of adequate calcium supplies to fecundity is of great interest.

Dr. Orr has mentioned Davidson's work at Cambridge, and also the Wisconsin experiments of Hart, in which cows upon a calcium deficient ration became sterile, but the addition of calcium to the food resulted in the birth of healthy, normal calves.

There seems now to be little doubt that there exists an antagonistic relationship between ovarian and parathyroid hormones, and I have evidence that in the cow there is a drop in blood calcium at œstrum. (The occur-

rence of so-called delayed milk fever at œstrum may have its explanation in this.)

In these days, when sterility in cows entails such economic loss and when there is such demand for its investigation, I would suggest that the possibility of its association with derangements in calcium-phosphate metabolism cannot be overlooked.

It would appear, then, that this simple substance calcium, as cheap, as common as dirt (which it may largely compose), as old as the hills from which it is quarried, is an agent of prime importance to the general well-being of the animal, to its productive and reproductive powers, and to the defence of the organism against disease by the neutralisation of both the toxic by-products of metabolism and the toxic products of pathogenic bacteria.

It is obvious that its further investigation is urgent to the needs of Comparative Medicine.

In these days there is a tendency to decry the supposed efficacy of drugs in the treatment of disease. Such drugs as iron, lime and phosphorus, arsenic, iodine and magnesium, the esteemed "alteratives" of a former day, it is now the fashion to regard with scant respect as the crude agents of an ignorant and—thank Heaven—past generation, but I venture to believe that it was not because of ignorant fetishism, but rather because of shrewd clinical observation that these despised alteratives have so long held their place in therapeutics.

To-day we condemn the indiscriminate use of drugs and perhaps appreciate more clearly the importance of aiding the wonderful natural defensive and reparative powers of the animal body; but in the glare of modern enlightenment may we not be blinded to the fact that these old minerals are the components of the very fabric of the living cell?

Mr. W. A. Pool (Director of Research, Animal Diseases Research Association, Moredun Institute, Edinburgh): I propose to speak to-day from the point of view of the relationship to this subject of the diseases of hill sheep in Scotland. I presume that no one in this room disputes the fact that deficiency diseases are of greater importance to animal health than had been realised till fairly recently. The nature and the causes of the deficiencies are still perhaps imperfectly understood.

The mortality in the hill sheep over very large areas in Scotland is appallingly high, and must involve losses to stockowners representing more than a quarter to half a million of money annually. These losses have attained such notoriety that, over wide areas, what is known as an acclimatisation value is placed on the stocks of the sheep farms because it is well known, and has been well known for generations, that it is unsafe to take sheep on to these farms from what may be described as "healthy" farms. Farmers buying in stock for these affected farms have to be careful to buy them from farms with a similar reputation.

At the present time we have to speak with caution concerning the nature of some of the diseases from which the sheep die. The great work carried out by Dr. Orr and his team of workers has led to the production of evidence that over wide areas of the country there are specific deficiencies in certain nutritive elements in the general herbage to which the stock have access. He has stated that the addition of certain mineral constituents to the food of animals on such areas has reduced the mortality. This question of mineral deficiencies has exercised the minds of stockowners for some years now and there is no doubt that quite an appreciable proportion of the live stock of the country are getting mineral mixtures as additions to their rations. The mineral mixtures on the market appear to be rather expensive products but, even so, one has seen relatively large amounts, such as half ton consignments, on various sheep farms.

Is it yet possible to generalise to the extent of advising the use of one general mixture or of selecting mixtures for different parts of the country? The pronouncements of this meeting, held under the auspices of our National Veterinary Medical Association to discuss the question of mineral deficiencies, will be given great publicity by stockowners. We must weigh all the evidence carefully and ensure that a considered verdict be given.

Dr. Orr has pointed out that there is evidence that when there is deficiency of certain essential minerals in the diet of animals, increased susceptibility to bacterial infections may result. No one will, I think, deny this. At the same time, we must remember that in bacterial diseases many factors operate. The resistance or susceptibility of the host are two of the factors. The virulence of the infecting organism, the dose and the extent of the repetition of the dose are other factors. Many of us are accustomed to weigh resistance or susceptibility to disease in terms of vaccines and serums and we know that in many instances we can protect animals against many lethal doses of a highly pathogenic infective agent by means of the appropriate antibody. Presumably, we are not entitled to assess the effect of nutrition upon resistance or susceptibility in the same terms. Given a highly-infective agent and a host of average susceptibility, it appears to be unlikely that any form of nutrition will be able to lead to the production of natural immunity.

In consequence, when considering the operation of various factors in the causation of disease in the hill flocks of Scotland, which I have to-day taken as an example, we must be prepared to give full credit to the operation both of nutritional deficiencies and of specific infective agents.

It is unfortunately the case that research into animal diseases is still behind the times, merely because hitherto there has not been sufficient money available for work to be carried out. In these circumstances, because no infective agents have been demonstrated in connection with certain diseases, we are not entitled to assume that they are absent. As an example I can give "louping-ill." There have been suggestions that this disease is a result of nutritional deficiencies. Recently we have been working at it in the laboratory of the Animal Diseases Research Association and have isolated an infective agent which we believe to be the cause of the disease.

There is no question that, as a branch of pathology, deficiency diseases offer a fertile field. We can be proud that possibly the finest work on this question has been carried out by members of our profession and that members of the college of which most of us are Members or Fellows have been associated in this work. I refer to the work carried out during the last few years under Sir Arnold Theiler in South Africa. At the present time there appears to be need for the younger members of the profession, who

are considering research careers, to direct their attention to the possibility of devoting their lives in this important direction and of taking their share in the development of this sphere of animal physiology and pathology.

Mr. O. STINSON (Appleby): I have associated cases of milk fever with deficiency of calcium in food, and have found that bone meal is the cheapest way of supplying calcium and phosphorus. I have given calcium to a cow during the lactation period, and she is now milking much better. Another good way of supplying calcium is by giving white fish meal. As veterinarians, we have a great work to do here. I think we should advise the experts as to how to feed cattle. More calcium should be put into the food, for calcium must be put into the system before it can be taken out. The farming community should know that every time they put calcium into the food they are helping themselves.

Mr. J. O. POWLEY (Ministry of Agriculture): One of the remarks of Professor Pool with regard to losses amongst hill sheep struck me. I should like to point out that there are as big losses from lambing sickness amongst Lowland sheep as amongst hill sheep. I remember that when I was a boy in the East Riding of Yorkshire a loss of 5 per cent. in a season amongst lambing ewes was thought to be tremendous; but nowadays it is nothing unusual for farmers to have 25 per cent. of losses. I have come to associate this condition with the alterations in farming practice during the past fifty years. In the old days farmers limed their pastures, but to-day very few farmers ever think of liming their fields. Farmers used to use bone meal. How often do we see it in use to-day?—the trouble being that they cannot afford to buy it. I have advised farmers in the East Riding of Yorkshire that the easiest way out would appear to be to go back to the old liming methods.

Mr. W. NAIRN (Blairgowrie): Practitioners, up to a point are in agreement with the essayist that mineral matter affects the health of domestic animals. One's observations suggest that the extremes of drought and moisture both favour a deficiency of important substances in plants with a consequent production of disease in animals nourished solely on that herbage. The limits of the range of these diseases are rather difficult to determine.

On farms in the West of Scotland they seem to suffer from low fertility in ewes, which is probably due to deficiency of mineral matter, resulting from excessive rainfall.

Dr. Orr tells us how ultra violet rays and cod liver oil increase the fixation of calcium and phosphorus in the tissues. Experience in cattle rearing shows that providing exercise, without necessarily keeping them outside long enough to get benefit from sunlight, prevents rickets. How does exercise act? Is it in virtue of the higher standard of metabolism produced in the fitter animals that rickets is prevented? If this is so, exercise must be another factor in the fixation of these essentials.

When we consider that exercise, sunlight and cod-liver oil are such important requisites to the economical use of mineral matter in the animal body, then it must appear sounder practice to provide these factors first, so that the animal is able to utilise fully what little supply of mineral is in his diet. It therefore behoves us, as a profession, to emphasise the importance of good hygienic conditions rather than the use of expensive mineral mixtures under conditions unsuitable for their proper utilisation by the animal.

Young stock on most arable farms can be reared quite successfully on a well-balanced dietary if provided with plenty of open-air exercise. Such methods will give better results than mineral mixtures and are more suitable to these times, when agriculture needs every economy.

A MEMBER: I remember how a herd of pedigree Ayrshire cattle—about eighty in number—was taken from the Cotswolds to the Midlands of England. While in the Cotswolds the herd flourished, as it had done originally in Scotland, but in the Midlands the animals became tubercle-infected, and were not so obviously healthy. I am not suggesting for a moment that their transference to the Midlands was the cause of their becoming tubercle-infected; there were other factors, such as the introduction of cattle without due periods of isolation. Of the herd, sixty odd were cows, and over fifty of them re-acted. Such a thing was not observed in any other cows. In Shorthorns the rapidity of infection is not so marked. I wonder if this is due, in some sense, to a calcium deficiency, and if the Ayrshire cattle require a greater proportion of calcium than other breeds.

Mr. J. W. MCINTOSH (London): Dr. Orr has given us a very interesting contribution, but I regret that he has not told us something about the mineral requirements of working horses. Most of the research work done in connection with the feeding of animals—in this country at any rate—has been confined to farm stock, and those of us who are associated with the care and supervision of large studs of transport animals have had little or no assistance from the research worker. I think this is very regrettable, as I am quite convinced that many thousands of pounds could be saved annually if horse owners were given scientific help and guidance in the compounding of suitable and economic rations.

I have been trying for many years —in my own little way—to provide such a diet, and I think I have succeeded up to a point, but much yet remains to be done, as the facilities for carrying out experimental work are very difficult to supervise and control under the ordinary conditions of transport.

Hitherto we have not given much thought to the "mineral contents" of a diet for working horses, and I would like to ask Dr. Orr as to how far they should be given effect to, in our calculations. Most articles of diet will, I presume, contain, in some measure, one or more of the mineral substances indicated, but is it wise to leave this to chance? Is it not possible and very probable that many of the deficiency diseases which we have to encounter to-day have their origin in lack of mineral supplies?

Dr. R. F. MONTGOMERIE (Veterinary Advisory Officer, University College of North Wales): I have always been interested in the practice which Ayrshire breeders make of not turning calves born during June, July and August out of doors at all that year. Those calves born earlier in the season are, of course, turned out. The reason advanced for keeping the later calves indoors is that they do not do so well if turned out. I can confirm that from my own observations and, so far as I have seen, any disadvantage associated with turning late calves to grass is not associated

with an infestation or an infection. Dr. Orr has emphasised the importance of calcium to the young growing animal and how the assimilation of that mineral is aided by the feeding of green food and exposure to sunlight. The practice I have mentioned appears, then, to be contrary to present day ideas and I wonder if Dr. Orr has a way of explaining it. He might also explain to the meeting the effect on calcium metabolism which the giving of a large dose of an alkali, sodium bicarbonate, is likely to have.

Principal F. T. G. Hobday (London): Has anything been done in connection with dogs, so far as calcium is concerned?

Dr. Orr: I do not think anything has been done.

The Reply.

Dr. Orr, in the course of his reply on the discussion, said: With regard to the question of calves doing better indoors than out of doors—on general grounds, one would assume that they would do better outside than inside. It would be interesting to know what was the nature of the pastures in the part of the country referred to. Concerning what Mr. McIntosh has said about horses, I think a good many of the rations of horses are liable to be deficient in calcium as compared with the ration of cows. On the other hand, the requirement for calcium is much lower in the horse than in the milk cow. It is probable that horses which get little or no grazing may suffer from deficiency of calcium to an extent which affects their resistance to disease. As regards cows, apart from the inherited susceptibility to disease, which may vary in different species, the animal most likely to suffer is the one producing at the fastest rate. That is the animal upon which the greatest strain is placed. The question of mineral mixtures has been raised by one of the speakers. These mixtures are placed upon the market by commercial companies which have great powers of propaganda and which often show more zeal than discretion in urging upon stock owners their use. It is obviously absurd to expect that any single salt mixture will meet the deficiencies exactly in every case, because the nature and extent of the deficiencies would vary from one type of pasture to another and from one type of ration to another. Further, many pastures and rations have no deficiency and therefore no mineral mixture is required. If a stock owner has reason to suspect that his animals' rations are deficient in any mineral element, he should take the advice of a veterinary surgeon or some other person of skill and knowledge who, after considering all the facts of the case, including the composition of the ration being fed, would be able to make suggestions about the balancing up of his ration by the addition of some simple, cheap mineral rich substance.

With regard to deficiency diseases, which was the main subject of this address, calcium and phosphorus being used merely as examples of substances which are believed to be deficient, it is gratifying to think that this important aspect of animal health is receiving more and more attention, and that we are now gathering a great deal of information upon the subject. The information of which the research worker is most in need at the present time is to be got from practical clinical observations. This forms an

(*Continued at foot of next column.*)

Bacillary White Diarrhœa (B.W.D.): B. pullorum isolated from a Turkey Poult in England.

By T. Dalling, J. H. Mason and W. S. Gordon,
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It is generally accepted that in Britain *B. pullorum* is found only in the domestic fowl, especially in young chicks. In 1928 we[1] recorded its isolation from sparrows which in all probability picked up the organism from infected chick runs. The organism has been isolated from young turkeys in America by Hewitt[2] and Lucet[3] has shown turkeys to be susceptible to artificial infection. We believe the following to be the first record of the isolation of *B. pullorum* from a turkey poult in England.

From a small poultry farm on which a few turkeys are reared annually, two six-weeks-old poults were sent to the laboratory for *post-mortem* examination. During the course of our investigations we isolated *B. pullorum* from the liver of one of these birds. The organism responded to the various biological tests of *B. pullorum*. It gave typical fermentation reactions with the various carbohydrates, was agglutinated by *B. pullorum* agglutinating serum and was pathogenic for guinea pigs and mice in small doses. The turkeys showed no symptoms of diarrhœa. While we have no definite evidence that B.W.D. existed on the farm, the reported death rate among the young chicks was highly suggestive of its presence. The turkeys were hatched under hens, and had the same runs as the chicks. It seems probable that they became infected from the chicks and, though the organism may not have been the actual cause of death, it is of interest to record its presence in the liver of a turkey poult.

Conclusion.

B. pullorum was isolated from the liver of a six-weeks-old turkey poult.

References.

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[2] Hewitt, E.A., *Corn. Vet.*, 1928, XVIII, 3, pp. 272-276.
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Lamb Dysentery, 1929.

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The results of our experimental work in 1927-1928[1] showed clearly that a formalinised whole culture of the L.D. bacillus (anaculture) injected into ewes in the autumn,

(*Continued from previous column.*)

invaluable guide to further work. There is great need at the present day for closer co-operation between the clinicians and laboratory research workers. I believe that a great advance could be made if this co-operation could be assured and veterinarians were provided with the funds and facilities which doctors have. (Applause.)

Farm.	Lambs born from ewes inoculated twice.	Died of L.D.	Percentage.	Lambs born from ewes inoculated once.	Died of L.D.	Per centage.	Lambs born from ewes not inoculated.	Died of L.D.	Percentage.
1	59	—	—	47	1	2·1	46	6	13
2	65	—	—	65	—	—	72	9	12·5
3	59	—	—	56	2	3·5	55	20	36
4	127	3	2·4	128	1	0·7	142	15	10·5
5	224	1	0·4	103	1	1	92	16	17·4
	534	4	0·75	399	5	1·3	407	66	16·2

and again just before lambing in the spring, prevented lamb dysentery in their lambs. We considered that ewes so injected would possess sufficient ground immunity that one further injection of the antigen near lambing time would be sufficient to raise the immunity to a degree sufficient to protect the lambs. This involves the omitting of the autumn injection in ewes already fully immunised the previous year. We had already some evidence on this point; some farmers had practised this method with apparently good results. During the past season we carried out a controlled experiment in Scotland on five farms. The ewes on each farm were divided into three groups; one group had at no time received any inoculation, while the ewes of the other two groups had been injected in the autumn of 1927, and again in the spring of 1928. The first group was again kept as controls and received no injections; the second group was injected twice, in the autumn, 1928, and again in the spring, 1929; the third group was injected in the spring 1929 *only*. The table shows the result of this experiment; of 534 lambs born from ewes inoculated in the autumn and again in the spring, four, or 0·75%, died of lamb dysentery; of 399 lambs born from ewes inoculated in the spring *only*, five, or 1·3%, died, while of the 407 lambs born from uninoculated ewes, sixty-six, or 16·2%, died. The difference between 0·75 and 1·3% in groups of 400 to 500 lambs is probably of no significance. In any case, it is clear that the third group had developed a high grade immunity.

The ewes in all groups were subjected to the same conditions, and a careful *post-mortem* examination was carried out on all dead lambs.

Conclusion.

This controlled experiment indicates that a single dose of formalinised whole culture (anaculture) of the L.D. bacillus injected near lambing into ewes which, the previous year, were fully immunised against the organism, is sufficient to raise the immunity so that the lambs are protected against lamb dysentery.

Reference.

[1] Dalling, T.; Mason, J. H.; and Gordon, W. S., *Vet. Jour.*, V.84, XII, pp. 640-648.

The Ministry of Agriculture estimate that during 1928-29 some 1,422,000 cattle, 926,000 calves, 7,003,000 sheep and lambs, and 4,112,000 pigs were sold fat off farms in England and Wales for slaughter.

The Choice of Food.*

By R. G. Linton, M.R.C.V.S., Professor of Hygiene and Dietetics, Royal (Dick) Veterinary College, Edinburgh.

In choosing foods obviously the first thing to do is to consider the purpose the food is intended to serve, and selection to fulfil the purpose cannot be properly done unless one has a fairly comprehensive idea of the quality, nature and composition of the many foods of which use can be made by the British stock owner. Clearly, therefore, it would be distinctly advantageous to become familiar with the raw material at our disposal. This applies equally to the veterinarian as to the farmer, because a great deal of the work of the veterinary practitioner is concerned with erroneous dieting.

Of the scores of different foods available to the farmer no two have exactly the same composition and consequently no two produce exactly the same results when fed to an animal. But it is nevertheless possible to group the foods and to consider, for all practicable purposes, the foods within a group to be more or less interchangeable, but please note, more or less, not absolutely.

The grouping is commonly done thus:—

1. *Succulent Foods.*—Roots, cabbages, etc.
2. *Coarse Foods.*—Hay, straws, etc.
3. *Nitrogenous Foods.*—The Legumes, such as peas and beans, and the oil cakes, etc.
4. *Carbonaceous Foods.*—The Cereals, such as oats, maize and barley,

and to these groups we may now add a fifth, a *Nitrogenous Succulent* occupying a unique position, young pasture grass. A brief statement of the nature of these groups may perhaps be helpful.

The *Succulent Foods* supply energy (or calories), salts, vitamins, fibre and bulk. They are appetising, freely eaten by stock and undoubtedly are beneficial when used in moderation.

Coarse Foods supply bulk and energy and act as diluents for rich foods; they stimulate movement of the bowels and help rumination.

Nitrogenous Foods supply energy, but are primarily used for their albuminoid content. They are particularly required by young growing stock, milk producers and hard-working horses. As a rule they are the most expensive forms of food and are often wastefully used.

Carbonaceous Foods are the main energy suppliers and constitute the chief part of rations and are the raw materials from which fat is made. They are cheaper than nitrogenous foods and form the bulk of farm crops.

* Paper presented to the North of Scotland Division, N.V.M.A., at Aberdeen, on 21st September, 1929.

The proper combination of foods from these groups constitutes what is called a *well-balanced ration*. There is no such thing as a perfect diet; consequently, a perfectly balanced ration can never be obtained, for the simple reason that the needs of the animal body, and particularly of growing stock, are constantly changing. But it is possible to construct a diet that will supply the nutriment required with the minimum of waste, or perhaps one should say, with less waste than is often the case.

In order to make a proper choice of foods from these groups the feeder must know what the body requirements are, and these have been expressed for each class of animal in what are called *Feeding Standards*. A knowledge of feeding standards, which cannot be further discussed in this paper, is essential for economical, and therefore for successful stock feeding. Without this basic knowledge stock breeding must remain on a par with the somewhat haphazard methods of dieting practised in the average home.

The feeding of stock is essentially a business undertaking, but the animal differs from an ordinary factory in that the machine for the conversion of material is infinitely more delicate. In all manufacturing processes oncosts receive very careful consideration; so should they in the manufacture of flesh, milk or eggs. It is one aspect of oncost reduction that I wish to discuss in particular this afternoon—the economic choice of foods.

Compared with the methods of feeding commonly practised in our own homes, where we feed more by inclination than in accordance with physiological and economical requirements, the dieting of livestock is far advanced, being carried out with greater intelligence and more thriftiness. But in the present time of agricultural stress and need for world economy it is worth while endeavouring to do still better. So heavy are food bills for fattening cattle, dairy cows, pigs, etc., that even a slight reduction per cwt. for purchased food must mean a considerable saving in the course of a year.

In these days, when activity in agricultural research is brought so much to public notice, we are liable to look upon all knowledge as new and to forget the pioneers. As long ago as 1851, Wm. Hunting, a member of our profession, who did so much towards freeing the country from glanders, pointed out how money could be saved, and the health of animals improved, by more careful attention to the selection of food and its method of administration. He reorganised the feeding of pit ponies. He halved the allowance of hay and had it all cut instead of having it distributed in that wasteful fashion that is still so common on many farms. Oats at the time were very dear. Accordingly, instead of continuing to feed oats, he substituted a balanced ration of maize and beans. His reorganisation resulted in a marked increase in the efficiency of the ponies, in less disease, and on the food bill alone he effected a saving in 1873, in nine pits, of £27,054 1s. 6d.

What Hunting did in 1851 it is possible, though presumably in less degree, for us to do to-day, yet with greater certitude, because we have a greater knowledge of food values. How, then, are we to set about choosing our foods?

Primarily, as I have already indicated, we must have a clear understanding of our object in feeding; then we want to know the type of food which will fulfil the purpose, and finally what is the most economical food to use to attain the object aimed at.

In order to illustrate this, let us take the case of a farm horse required for ploughing stiff land, which, as everybody knows, is very hard work. Our object is to have the horse in good hard condition, active and strong and carrying a certain amount of weight, but not too much fat. We therefore require foods rich in energy—carbonaceous foods, such as oats or maize, foods containing a certain amount of fibre, but not too much, such as hay or good oat straw, and because the horse has to do hard work and be active, the diet to be satisfactory must contain a certain amount of a nitrogenous concentrate. Of carbonaceous concentrates, oats is that most generally used, but if the selling price of oats is good, either maize or barley may be substituted for part of the oats. Wheat is not a suitable food for horses.

Naturally, unless the market is such that good prices can be obtained for the farmer's cereal crops, it is better to consume grain on the farm than to sell it. But no farmer can tell if it would pay him better to feed his grain to his stock or to sell it unless he is able to evaluate the various foods he grows. Of the coarse foods, as is well known, good hay is the best, but good oat straw is better than inferior hay. Wheat straw, which is often given to horses, should not be used, as it is quite unsuitable.

Now there are farmers who, throughout the whole of the working season, limit the diet of their horses to oats and hay. I am in full agreement with Tod, who, in his book "Hints on Feeding," says that this choice of foods is wrong as the diet is deficient in albuminoids, with the consequence that you find, particularly at the beginning of the ploughing, horses that are too fat, very soft, easily tired, prone to heavy sweating and often troubled with colic or acute indigestion. If to such a diet were added two or three pounds of kibbled beans or a couple of pounds of nitrogenous oil cake, the horses would be in a much better condition for the hard work they have to do.

Further to illustrate the importance of the selection of suitable food, take the case of the newly-weaned pig. The diet of this animal must be similar in composition to that of sow's milk. It must contain carbohydrates, protein, and fat in much the same proportions as are found in sow's milk.

All the minerals required for normal growth must be there, as well as the much-discussed vitamins. In making a choice of food for this period the amount of fibre in the diet must be carefully controlled, remembering that weaning time is the transition period between feeding on liquids and solids, that is, between fibrous and non-fibrous foods. Therefore, obviously, the change must be made gradually.

In short, our choice of food for animals should be guided by definite and clearly-understood principles instead of being influenced by prejudice, custom or habit as is often the case. The guiding principles are these:—The chemical composition to be such as will fulfil, without waste, the chemical demands of the body, as I have indicated in the case of the working horse and the young pig. The food must be easily digested, otherwise so much energy will be expended in preliminary digestion that there is no balance left over from the food, *e.g.*, wheat straw given to horses. For highly productive animals, such as six-

gallon cows, the food must be capable of rapid digestion, otherwise the animal would not have time to consume the food it requires. The mechanical nature of the food chosen must be such as will aid digestion—a well-known example of this is the feeding of maize to horses, because if this cereal is given in large quantity, followed by soft meadow hay, disaster often results, for the reason that maize is deficient in fibre and cakes into a doughy mass in the stomach.

If, on the other hand, the maize is mixed with cut coarse hay, such as rye grass, timothy or cocksfoot, or mixed with oat straw, excellent results are obtained. One's choice of food must, therefore, often be guided by the nature of the other ingredients in the diet. The food must be palatable, though animals, in general, are less influenced by this than we are. They have not been spoiled by pampering. An important factor is the hygienic nature of the food. It must be of sound quality, not second-rate stuff like ship and mill sweepings. Damaged cheap food has from time to time caused heavy losses among stock.

Naturally we must exclude from our choice any food known to be unsuitable, such as foods containing oil of low melting point for fattening pigs.

I am rather sceptical about the alleged superiority of particular foods for special purposes, with perhaps one or two notable exceptions. By this I mean that when a farmer says that a particular brand of oil-cake gets his cattle fat more quickly than any other brand, I am more inclined to attribute the success, if success there be, to a happy, though possibly accidental, combination of all the ingredients of the diet rather than to a mysterious property held by a particular food.

Now we come to a point that I think is of great importance economically and to which I feel sure more attention might be paid—that is buying and using foods on their real nutritive value.

Let us assume that you have a list of foods from which you are going to choose, and we will not take into consideration either coarse foods or succulent foods, so as to simplify the argument. You have also excluded from the list foods that you know to be unsuitable. You have two groups to consider:—(1) Carbonaceous concentrates; (2) Nitrogenous concentrates; and you know, from your *Feeding Standards*, how much of each you are going to put into the diet. The various foods in each group are more or less interchangeable, but very few indeed have exactly the same value. Furthermore, the carbonaceous group must be valued in a different method from the nitrogenous group, because we are going to buy and to feed carbonaceous concentrates on the basis, primarily, of their energy content. The nitrogenous concentrates are bought—or should be bought—on the basis of their protein or albuminoid content. Neither of these types of food should be purchased on the basis of their tonnage price.

There are many methods of expressing the comparative value of foods; for example, in human dietetics a certain weight of food is said to contain so many calories; in America for animal foods so many therms (1,000 calories). In this country we have generally adopted the Starch Equivalent basis that originated in Germany. This method enables us to compare one food with another and to determine which is the most economical food to buy, which is what we want to know.

A certain confusion must exist in the minds of stock-owners on account of the multiplicity of methods adopted to express the same thing, for, in addition to the above, we have linseed cake equivalents, barley equivalents and so on, where linseed cake, or barley, or for that matter any other food, is taken as unity and other foods compared with it. A common, and in my opinion a very misleading method, is often adopted by food merchants when they advertise a food as containing a certain number of food units. This statement contains very little of value to a possible purchaser, but sometimes sounds impressive.

The Starch Equivalents are given in many agricultural papers and in publications by oil-cake manufacturers and one should perhaps assume that you know what is meant by the term.

If a food is stated to have a starch equivalent of 60 (which is the case with oats) this simply means that a hundred pounds of oats are equal to sixty pounds of the carbohydrate starch for feeding, or more accurately for fattening purposes. It is a means of expressing fairly accurately and certainly simply, just what you can get out of a food and is a very valuable method of enabling us to compare one food with another. It is very important for economical feeding clearly to understand this. For example, the starch equivalent of oats is 60, maize 80, bran 42 and dried grains 50. Some quoted prices per ton for these foods are:—oats £10, maize £10, dried grains £8 and bran £7 15s. By dividing the price per ton in shillings by the starch equivalent, the price per unit of starch, or unit of energy, or unit of food or anything else you like to call it, is obtained. Thus maize costs 2s. 6d., oats 3s. 4d., dried grains 3s. 2d., and bran 3s. 8d. Obviously therefore, with maize at £10 per ton and bran at £7 15s., bran is a very expensive form of food. You cannot get more out of a food than what it contains and it is clear that this method gives us a real idea of the market value of foods.

Now in the other group of foods, nitrogenous concentrates, we have primarily the albuminoid content to consider, though of course they also have a starch equivalent value. I will illustrate this by an actual example. The cost of feeding a herd of cows during the winter was at the rate of £2,500 per annum. The concentrates consisted of bruised oats 8lbs., bean meal 2lbs., linseed cake 4lbs., undecorticated cotton cake 2lbs., and locust beans 2lbs. To take one item from this, bean meal cost £11 10s. a ton, and at the same time Paisley meal cost £9 10s. These two foods both contain 20 per cent. of digestible protein. Therefore, Paisley meal could be substituted for bean meal and a saving affected of approximately £30 a year. In these two foods the cost at the above prices, per unit of protein, is 11s. 6d. for bean meal, and 9s. 6d. for Paisley meal. Calculated on the starch equivalent basis, bean meal having a starch equivalent of 66 and Paisley meal one of 74, the bean meal cost 3s. 6d. per unit of starch and Paisley meal 2s. 6½d. Therefore, purchased on either basis Paisley meal would have been the cheaper meal to buy.

Finally, I wish to draw your attention to a feeding experiment with chickens that I am carrying out with Miss Newbigin, of the Edinburgh and East of Scotland College of

Agriculture. Many of you may not be particularly interested in poultry rearing, but the principles shown in this experiment apply to other animals, as they make very clear the importance of the right choice of food. For some time we have been endeavouring to find out the best grain mixture for young chicks and in the present experiments we took four groups of newly-hatched chicks, 22 birds in each group. Group 1 received equal parts of millet, canary seed, hemp, lentils, peas, rice, groats, maize, wheat and dari, together with an unlimited supply of separated milk. Group 2, the same mixture, but with water instead of milk. Group 3, equal parts of maize, groats and wheat and separated milk. Group 4, the same simple mixture, but water instead of milk. The birds were kept under identical conditions and were given oyster shell and green food when available. The grain mixtures were weighed out daily and at the end of each day the residue was collected and weighed so that we were able to tell just how much food was eaten. The birds were weighed every five days.

The chart on the wall shows the growth, marked in grammes, of the birds and you will see (1) that the two groups receiving separated milk increased their weight to nearly four times that of the water fed pens; (2) that the simple mixture of maize, groats and wheat was just as good —at any rate up to egg laying time—as the more complicated and much more expensive mixture; (3) we also found out that while the birds getting separated milk ate much more food (I am not bothering you with weights) than the water fed birds, the actual food they consumed per unit of live weight increase was practically half that of the birds given water only. This surely is a very striking example of what can be done by careful choice of food.

Discussion.

Mr. J. C. Grant congratulated Professor Linton on his very excellent paper and said that he had little to criticise in it. He would like to mention, however, that Professor Linton, in his economic estimate of the value of a food, had made no mention of the manurial values of foods, which were so very important in some agricultural districts. He also wished to emphasise that the value of food alone could not be estimated purely on its nutritional estimates, but that environment was of very great importance. He instanced an experiment carried out on the Agricultural College Farm here, where stock fed outside on the same food as stock tied up, showed much greater improvement. Mr. Grant's argument was that other factors than actual food values have to be considered in estimating the worth of any particular food.

Mr. J. McAllan, on the economic aspect of the question, pointed out that where there were two foods of different money values but of the same nutritional value, the question of supply and demand would regulate the price; so that there would ultimately be no advantage in stock owners all buying the monetarily cheaper food, since the prices would tend to reach the same level. Mr. McAllan emphasised the importance of the value of separated milk in the feeding of young stock and instanced the recent experiments carried out by the Department of Health for Scotland in the feeding of school children, where the growth value, at any rate, of separated milk was estimated as being very high.

Mr. G. W. Begg thanked Professor Linton for his paper and said that he would mention one experience of his with regard to dairy cows and water supply, where it was found that drinking bowls in front of the cows had a very great influence indeed on the milk supply of a herd compared with watering the cows by hand buckets. The milk supply dropped very considerably on the removal of the drinking bowls and increased to the usual supply when these where replaced.

The President (Mr. W. J. Rice) wished merely to emphasise again the importance of separated milk. He gave as his experience that feeding calves on separated milk *plus* a tablespoonful of cod-liver oil gave most excellent results—quite as good as those fed on whole milk.

In his reply, Professor Linton said that many interesting points had arisen. He agreed fully with Mr. Grant's remarks on the need for calculating the manurial value of foods and, touching on the question of environment, he said that he would very much like to see grooming experiments carried out on both dairy cows and feeding stock. He was quite sure that the regular grooming of stock did improve the metabolism and, therefore, would improve the fattening of stock. It was his desire that someone might carry out such an experiment. Professor Linton agreed with Mr. McAllan on the question of prices and he put forward a plea for the use of Imperial foodstuffs in preference to others. He referred again to the use of separated milk and stated that the chickens which got the separated milk grew so vigorously that they developed leg weakness, but the addition of cod-liver oil to the separated milk did away with this weakness.

Mr. James Anderson, in proposing a vote of thanks to the essayist, stressed the importance of the personal element in the feeding of cattle. He pointed out how certain cattlemen were recognised as being "good feeders" even if their feeding stuffs were not of the best. Some men, he said, seemed to get better results than others, and that was attributable to that indefinite factor known as the personal element.

Physical and Physiological Activities of Cows.*

1. *Per cent time standing and lying,* cows in barn, winter conditions. Averages for all breeds show that cows in the University dairy herd spent practically 50% time standing and 50% lying. Individual variations ran as high as 76% time spent standing to as low as 35%.

2. *Daily water consumption.* On a three days' trial, sixteen cows in milk drank 4·38 pounds water for each pound milk given. The maximum daily amount was 233¾ for a Holstein producing 45 pounds milk daily. The minimum was 18 pounds for a dry Ayrshire.

3. *Amount urine and faeces voided daily.* A three days' trial with sixteen cows showed an average of 31·34 pounds of urine per cow, or at the rate of 26·8 pounds per 1,000 pounds live weight. The average amount of fæces per cow was 69 pounds, or 59 pounds per 1,000 pounds live weight. The ratio of fæces to urine was 2·2 to 1. This agrees substantially with findings at other stations.

4. *Number of urinations and defæcations daily.* Observarions of twenty-three cows for a one-day period and of sixteen cows for a three-day period showed that cows in milk averaged somewhat higher in number of urinations and defæcations daily. The number of urinations ranged from 2 to 15 inclusive; of defæcations from 10 to 24 inclusive.

5. *Time spent in eating and rumination.* Observations of a Jersey cow for a two-day period, and of two Holsteins and one Ayrshire for a one-day period showed that these cows (producing from 11 to 60 pounds milk daily) spent an average of 5 hours and 57 minutes in eating, and 8 hours and 5 minutes in rumination.

*From Technical Bulletin No. 35, New Hampshire Agricultural Experiment Station, by J. M. Fuller, Durham, N. H. *Veterinary Medicine*, February, 1929.

The average time spent in rumination, or chewing individual cud, was 53·9 seconds. The average time spent in deglutition and regurgitation of cud was 3·73 seconds.

Observations of twenty-two cows in stanchions showed that they spent approximately 3 hours daily in eating and 8 hours daily in ruminating.

Data were secured on the jaw movements of twenty cows while eating grain, silage, and hay, and while ruminating. The average jaw movements per cow while eating grain and silage were ninety-four per minute; while eating hay, seventy-eight; and while ruminating, fifty-five. The total jaw movements per day approximate 41,000.

6. *Pulse and respiration rates.* Approximately 1,700 observations were made on eight Ayrshires, seven Guernseys, fifteen Holsteins and nine Jerseys of the University milking herd.

The average respiration rate per minute of Ayrshires was 28·6; of Guernseys, 18·6; of Holsteins, 28·6; and of Jerseys, 21·7. Marked variations from the average were noted in cows in normal condition, ranging from eleven to sixty-four per minute.

The average pulse rate per minute of Ayrshires was 69·6; of Guernseys, 59·8; of Holsteins, 68·6; and of Jerseys, 62·7. As in the case of respiration, marked minimum and maximum variations in pulse were noted, ranging from thirty-eight to ninety-six times per minute.

The ratio of respiration to pulse ranged from 1:2·4 in Ayrshires and Holsteins to 1:2·8 for Jerseys and 1:3·2 for Guernseys.

(*b*) Observations of seven high producing cows kept in box stalls indicated appreciably higher pulse and respiration rates as compared with cows in the milking herd. The ratio of respiration to pulse ranged from 1:1·5 to 1:2·9.

(*c*) Two-hour observations of five high-producing cows in box stalls for a one-day period beginning with 4.50 a.m., and ending at 9 p.m. showed appreciable variations in pulse and respiration.

Opening of the New Session at Camden Town.

SIR J. MOORE ON THE NEED OF QUALIFIED MEN.

MAJOR-GENERAL SIR JOHN MOORE, in his opening address at the new session of the Royal Veterinary College, Camden Town, on Tuesday, October 1st, dealt with the question whether, with the replacement of horses by mechanical traction, the profession of a veterinary surgeon was worth taking up. He said that if there was a reduction in the total number of one class of animal there was an increase in another, and veterinary science was not restricted to one class of animal, but embraced all. There was diminution in the horse practice of large cities, but the horse was by no means extinct or likely ever to be so.

Diseases of cattle, sheep, and pigs required investigation, control, and rational treatment. Canine practice in recent years had shown a remarkable increase, far beyond the conception of the veterinary surgeon of 50 years ago. The heavy loss of human population during the Great War had created a desire for something on which to bestow affection; hence there had been an enormous increase of their canine friends of all breeds.

In the growth and development of the Empire the necessity for veterinary science and practice was apparent. The veterinary surgeon could be described as a pioneer of Empire, for new Colonies and Dependencies could not be established and developed without live stock. Veterinary experts were needed to control their diseases and

(*Continued at foot of next column.*)

CLINICAL REPORT.

Canine Hæmorrhagic Enteritis.

By J. MCCUNN, M.R.C.V.S., M.R.C.S., L.R.C.P.,
Royal Veterinary College, London.

Considerable notice has been given recently to this disease, particularly as to its effects upon Greyhounds. Some observers have gone so far as to describe it as a new disease; at all events, one might say that prior to the onset of mechanical racing the disease was practically unknown. Its ravages are well known, and for some considerable time it has been the greatest scourge of the dog-racing world.

Its sudden onset, its virulence and our apparent helplessness have made it one of the bugbears of the veterinary surgeon's life. Many treatments have been tried, but they have availed little. I would like to bring to the notice of the profession a line of treatment which, in my hands, has given practically 100 per cent. of success. One hesitates to regard any treatment as specific except after very prolonged trial.

My procedure is to give an intravenous injection of formaldehyde as soon as possible. The technique is simple, all that is necessary being a hypodermic syringe with a needle of a fair bore.

The site of injection is the large subcutaneous vein to be seen ascending the outer aspect of the hock and leg. Do not fill the syringe completely with the fluid to be injected. When the needle has been inserted the piston of the syringe may be withdrawn to its full limit. If the needle is correctly inserted blood will flow into the syringe. The vein is now allowed to collapse and the syringe contents are slowly injected. Before withdrawing the needle, draw a little blood into the syringe.

This technique is, as stated, simple, and after one or two trials it is surprising how quickly and with what ease 4 or 5 cc. can be injected. All aseptic precautions should, of course, be taken.

In a series of twenty-five cases I have not had a single failure as a result of the disease.

Two deaths have occurred, one twenty-one days after the injection. The animal recovered from the hæmorrhagic

(*Continued from previous column.*)

advise about their production to advantage. State service, therefore, whether home or Colonial, Army or Civil became an important and attractive field for the veterinary surgeon. The necessity and demand for the veterinary expert by Governments and municipalities were on the increase, and it was becoming more and more realized that he was an indispensable economic factor.

He was greatly concerned at the amount of unqualified veterinary practice that was permitted to prevail in this country. The practice of medicine and surgery, whether human or veterinary, should be so regulated by law that none but duly qualified and registered practitioners should be countenanced. It seemed extraordinary that the only profession which had succeeded in obtaining adequate protection was the dental profession. The time had come when the general public should demand that empiricism should be ruled out, and haphazard methods of treatment should give place to those which were the outcome of perfect knowledge of human and animal form and function.

enteritis, but unfortunately succumbed as a result of a septic leg. The sepsis was no doubt due to (a) a dirty needle, or (b) the injection of the liquid into the tissues around the vein.

The second death occurred four days after injection, the patient recovering from the enteritis, but succumbing to heart failure. The *post-mortem* revealed no sign of enteritis.

The risk of leg infection is negligible if due care is taken, but the mortality rate of the disease would warrant the risk even if it were considerable.

During the course of this series of cases six dogs have been left without intravenous medication, and in spite of all care death occurred in each case.

The injection has an immediate noticeable effect, a general acceleration of the respiratory and circulatory systems being observed. There may be some uneasiness for from twenty to thirty minutes. After the preliminary uneasiness, many sleep. Two cases needed two injections at a twelve-hour interval. The other cases were completely recovered in twelve hours; in many cases no more blood was seen.

The treatment is followed by a raw meat diet for three or four days, combined with a simple aperient mixture in which formaldehyde is included. This series of cases may have been "just luck": let others prove or disprove. Each case was definitely one of hæmorrhagic enteritis—no doubtful cases have been included.

I close by expressing my indebtedness to Lieut.-Col. F. Fail, M.R.C.V.S., without those good will and collaboration I should not have had the success that has come my way.

REVIEW.

[**The Uses of Iodine and its Compounds in Veterinary Practice.** By Lt.-Col. H. A. Reid, O.B.E., F.R.C.V.S., D.V.H., F.R.S.E. Published by De Cruchy & Co., Ltd. Price, 3s. 6d.].

This book comprises 78 pages of text, and is a somewhat extensive accumulation of data regarding the value and use of iodine and its compounds in the prevention and cure of diseases of the domestic animals and poultry. Eighty-nine authorities are quoted.

Chapters are devoted to the use of iodine externally and internally; in the prevention and treatment of specific and general diseases and diseases of undetermined origin; as a parasiticide; and finally the influence of iodine on nutrition, reproduction and disease resistance.

A number of interesting sheep and pig-feeding experiments are quoted, both from this country and America, in which it is shown that the inclusion of small doses of potassium iodide in the diet encourages rapid growth and early maturity. There is also some evidence, although as yet not conclusive, that fertility is increased. In goiterous districts in which the pastures and drinking water are deficient in iodine very marked improvement in condition and fertility of stock attends the inclusion, in the diet, of iodides.

Dealing with specific and general diseases, Col. Reid's book serves to remind us of the work which has been done and the good results obtained by the use of iodine in the treatment of such conditions as actinomycosis, equine influenza, strangles and pneumonia, purpura hæmorrhagica, endometritis and sterility in cattle.

Quoting experiments carried at the Storr's Agricultural Experimental Station, Connecticut, good results are reported to have attended the use of iodine in the form of Lugol's solution in the treatment of parasitic gastritis in sheep. Similar treatment might well be given a trial in young cattle and sheep in this country.

As a prophylactic, Col. Reid produces a little evidence to show that the use of potassium iodide reduces the incidence of joint-ill in foals, and in dealing with contagious abortion tends to discredit the use of live vaccines of *B. abortus*, and recommends that an extended trial be given to potassium iodide as a prophylactic, based, not upon any definite evidence, but upon reports which support the view that iodine influences favourably infective processes of the most virulent types.

Under the heading "Diseases of undetermined origin" the writer deals with such conditions as grass sickness, braxy, scrapie. Referring to grass sickness, is the following:—

"The actual cause of grass sickness has not, up to the present, been determined, though it seems obvious that it must have a dietetic origin, arising probably from a defective mineral balance in the constituents of the food consumed which, in turn, may depend upon the lack of available mineral matter in the soil. Long continued grazing is known to exhaust the iodine content of the soil, and, in these circumstances, the element will be proportionately deficient in the herbage. Iodine, as we have seen, not only stimulates the protective mechanism of the body against infections of all kinds, but also favourably influences metabolic activity by helping to conserve the nitrogen and phosphorus supplies, and securing an increased retention of calcium."

Arguing on the analogy of the last sentence, iodine becomes the "*sine qua non*" of all treatment. Col. Reid refers to it again and again. He applies it to milk fever, and suggests that in view of the deduction of Dryerre and Greig that milk fever is the result of a fall in blood calcium, iodine should be given as a prophylactic to conserve the body calcium. He applies it to tuberculosis, in view of the fact that Dr. J. B. Orr has stated that there is evidence for believing that the high incidence of tuberculosis in good milking cows is associated with prolonged losses of calcium due to the excessive secretion of milk.

In both braxy and scrapie, in view of their localised nature, the writer suggests that deficiency in minerals, including iodine, may feature as a basis of these troubles.

The book contains a lot which is controversial; if Col. Reid is right, iodine has an unlimited field of usefulness in therapeutics. It is recommended that it be widely read, and some of its suggestions at least given a trial.

J. G. W.

Dr. Voronoff, the rejuvenation expert, is this month to perform in Paris, on a huge scale, gland grafting operations with a view to producing a race of "super-sheep" to increase the production of wool and meat.

ABSTRACTS.

[Active Hyperaemia produced by subcutaneous injections of Tincture of Iodine in the treatment of severe wounds. LAGAILLARDE. *Rev. Vt. et Jl. Méd. Vét.*, Oct., 1928, Vol. 80, pp. 544-547.]

The author puts forward the view that it is a great advantage in the treatment of severe injuries if an inflammatory reaction can be stimulated as soon as possible after the wound has been received. Ordinarily, inflammation does not follow immediately on the infliction of a wound. The inflammatory reaction is not produced by the damage caused directly to the tissues, but mainly by the subsequent infection of the wound with organisms. If then it were possible to produce an inflammatory reaction promptly the contaminating bacteria would not gain a foothold so readily. This Lagaillarde does by giving four or five injections each of 1·5 c.c. of a mixture of equal parts of tincture of iodine and water subcutaneously around the wound at a distance of six to eight centimetres. The effect of this is the rapid production of a condition of œdema round the wound which persists for a week or more. If pure tincture of iodine be used there is a risk of abscess formation. The method is said to be of particular value in the case of wounds involving joints or tendons, and there is generally no need for direct treatment of the wound. In the case of lacerated wounds the usual therapeutic and surgical procedures are employed in addition to the injections of iodine.

Details are given of eight cases in which the injection treatment has been resorted to. It would seem that in cases of injury to the fetlock recovery is complete in about ten days. One case of severe broken knee with open joint required three months before recovery was complete. Five injections of iodine were given when the injury occurred and two, one on either side of and just above the knee, ten weeks later. There is no mention that any other treatment was resorted to. The persistent swelling caused by the injections prevented flexion of the joint and at intervals fragments of necrotic tissue came away from the wound.

A. L. S.

[Rupture of the Stomach in a Horse caused by Ascarides. BUCICA and AUREL. *Rev. Vt. et Jl. Méd. Vét.*, 1928, Sept., Vol. 80, p. 500.]

The case described occurred at the military Hospital at Bucharest, and the symptoms presented were as follows: Dilatation of the nostrils, dyspnœa, imperceptible pulse, congestion of the visible mucous membranes, ears cold, tumultuous heart, and general rigors. The temperature was 39·9° C. The following day the symptoms were more pronounced. As it was suspected that the case might be one of anthrax a large dose of anti-anthrax serum was injected intravenously. Three hours later death occurred.

At the *post-mortem* examination the following lesions were found. The abdominal cavity contained a blood-stained serous liquid mixed with foodstuffs, and from this liquid eleven ascarides were recovered. The posterior surface of the stomach showed an almost circular rupture twelve centimetres in diameter with thickened and congested edges. The stomach contents weighed 2·5 kilogrammes and twelve ascarides were found in it. The other organs were all normal. No evidence of a bacterial infection of any kind could be found.

As there was nothing to indicate that the rupture resulted from impaction of the stomach, the authors conclude that the ascarides were responsible for it.

A. L. S.

[Completed Experiments to determine whether Avian Tuberculosis can be transmitted through the eggs of Tuberculous Fowls. C. P. FITCH and R. E. LUBBEHUSEN. (*Jour. Amer. Vet. Med. Assoc.*, 72 (1928), No. 5. pp. 636-649.) *Exp. Sta. Rec.*, Vol. 60, 1929.]

This is a detailed report of work conducted at the Minnesota Experiment Station, of which an earlier account has been noted (E. S. R., 53, p. 384). As a result of the present work and of that previously reported, the authors view the danger of transmission of tuberculosis through naturally infected eggs as of little practical consequence. The bacteriological studies do not support the view held by some that eggs from tuberculous birds frequently contain tubercle bacteria, nor is it believed that the danger of spreading avian tuberculosis through shipping day-old chicks has any basis in fact. At the same time it is pointed out that eggs do rarely contain tubercle bacilli, and that if such eggs are incubated the number of bacteria is greatly increased.

[The 1929 Outbreak of Foot-and-Mouth Disease in California. MOHLER, J. R., *J. Amer. Vet. Med. Assoc.* 1929, September, Vol. 28. No. 3. p. 309.]

The source of infection in the recent Californian outbreak has been definitely traced to trimmings of fresh meat brought by a ship in direct contravention of the Bureau of Animal Industry Order of 1926, which prohibits the inportation of all fresh and frozen meat from regions where foot-and-mouth disease exists.

Foot-and-mouth disease has been introduced into the United States on former occasions through the agency of infected fresh meat. In 1924, the disease broke out amongst some pigs which were fed on frozen meat purchased from a dealer who imported carcases from South American Countries. During the outbreak, it was established that infection in 22 herds was directly traceable to food-stuffs and garbage, in most instances local garbage containing meat and milk obtained from infected animals before symptoms of the disease were in evidence.

In the 1924 Californian outbreak, the disease first arose in a herd of hogs which were fed on garbage obtained from the Navy Yard. The contamination of the garbage was attributable to a naval vessel which had obtained its supply of fresh meat at ports in the Orient where foot-and-mouth disease was known to exist.

The origin of the 1929 outbreak in the Los Angeles County is of special interest. An American ship called at Beunos Aires on November 2nd, 1928, and took on board a quantity of fresh and cured meat. The ship returned to the port of Willington, California, on December 9th, 1928, and remained there until the 29th. During this period, a portion of the meat was transferred to a second ship, and the trimmings of the meat from both ships were deposited in garbage cans which, in accordance with a regulation governing the destruction of foreign

insect pests, were disinfected by the application of steam passed through a hose which was pushed into the refuse. It is pointed out that, although this method is effective in dealing with insect pests, it is unlikely to destroy the virus of foot-and-mouth disease.

The refuse from the ships was sold to the owners of large hog ranches. On January 10th, 1929, symptoms of the disease were first noticed on one of the holdings where 2,271 pigs were being garbage fed. By the time veterinary assistance had been sought, there were at least 100 lame hogs with high temperatures, although the characteristic lesions of the disease had not then appeared. The premises were immediately quarantined and material was obtained from infected pigs for the inoculation of two calves, a number of pigs and a horse.* On January 17th, the inoculated animals, with the exception of the horse, proved to be positive, whilst a cow, which was kept on the premises, developed the disease through natural exposure. Accordingly, all infected and exposed animals were slaughtered and buried. During the following week, no fresh cases of the disease appeared. On January 30th, however, a neighbouring dairy herd was found to be affected, and all the animals were slaughtered and buried on the same day. Between this date and February 16th, four further herds of cattle became infected and were disposed of. No other outbreaks occurred, and the quarantine was lifted on March 18th.

Commenting on the outbreak, Mohler observes that it was of the shortest duration and involved the smallest number of animals and premises of any of the outbreaks dealt with by the Bureau. The success in limiting the spread of infection to five premises is attributed to the very prompt diagnosis and slaughter of infected and exposed animals. The use of chicken-wire fences for enclosing infected premises was a noteworthy innovation. These fences not only excluded roving dogs, cats and poultry, but also prevented the removal, without authority, of hay, manure and other possible carriers of infection. In accordance with the recommendations of the U.S. Foot-and-Mouth Commission, sodium hydroxide (1-1·5% freshly prepared solution) was used as a disinfectant.

* [In view of the possible confusion between foot-and-mouth disease and vesicular stomatitis, the use of the horse is of interest.]

Army Veterinary Service.

Movements of Officers.

Major J. Leigh was posted from Aldershot to the Northern Command for duty on the 24th September, and is now stationed at Newcastle.

Major R. T. Smith and Lieutenant A. G. Ralston sailed for India, for a full tour of duty abroad, on the 20th September.

Lieut.-Colonel H. E. Gibbs, D.S.O., sailed for Egypt on the 28th September, for the purpose of assuming duty as Assistant-Director of Veterinary Services, British Troops in Egypt.

University of London Lectures.

An announcement in the *Official Gazette* of the University of London, states that a course of lectures on "Recent Researches on Immunisation against Distemper in the Dog" will be given by Major G. W. Dunkin, M.R.C.V.S., of the Medical Research Council Field Research Laboratories, at the Royal Veterinary College, on Wednesdays, November 6th, 13th, and 20th, at 5-30 p.m.

DIVISIONAL REPORT.

North of Scotland Division, N.V.M.A.*

Meeting at Aberdeen.

The half-yearly meeting of this Division was held in Marischal College, Aberdeen, on Saturday, September 21st. Mr.W. J. Rice, President, was in the Chair, and there were also present the following members :—Messrs. W. Anderson, J. Anderson, G. W. Begg, D. Cumming, J. C. Grant, G. Howie, J. Lyon, J. C. Mitchell, W. J. B. Robson, A. Sievewright, J. I. Edgar, and J. McAllan (Hon. Secretary).

Visitors.—Messrs. Davidson, Soutar, Stewart, Shanks and Ross.

Apologies for absence were received from Messrs. Drennan, Niven, D. Crabb and H. W. Robson.

The minutes of the last meeting, as they appeared in the *Veterinary Record*, were taken as read and were approved.

Correspondence.—The Secretary read letters, dated 4th July and 13th September, from the Secretary of the National Veterinary Medical Association with regard to the addition to Article 59 of the Articles of Association. After discussion, it was proposed by Mr. J. Anderson and seconded by Mr. Begg, that the proposed alteration would be of advantage and that the Secretary be instructed to inform headquarters that it was the view of the Division that the necessary addition should be made.

A letter was read from the Secretary of the Scottish Branch asking for the opinion of the Division on the Scheme for the Eradication of Bovine Tuberculosis as put forward by the West of Scotland Division. Whilst all the members were of opinion that the scheme was a very good one, the general feeling was that it is rather too ambitious and that greater consideration would have to be given to the types of herds found in different parts of the country. The members were generally of opinion that in drawing up the scheme too little regard had been paid to different conditions in different parts of the country and that a scheme less radical might with greater advantage be adopted. The Secretary was instructed to write the Secretary of the Scottish Branch in these terms.

The President then called upon Professor R. G. Linton, of the Royal (Dick) Veterinary College, Edinburgh, to deliver his paper on "The Choice of Food."

Professor Linton's paper was exceedingly interesting and was very much enjoyed by the members present. The discussion which followed was not a lengthy one, but this was due, as most of the members pointed out, chiefly to the excellence of the matter of the paper and to the difficulty of discussing it without its having been read previously. It was the feeling of the members that Professor Linton's paper would be a very delightful one to read on publication. (Both paper and discussion are reproduced elsewhere in this issue.—Ed.).

Mr. James Anderson proposed a hearty vote of thanks to Professor Linton for his kindness in coming north to give the Division such an excellent discourse.

(*Continued at foot of first column next page.*)

* Received on 27th September.

From The Veterinarian, March, 1829.

Veterinary Medical Society, Nov. 26th, 1829.

A paper was read by Mr. John Field, jun., on Pleurisy in the Horse.

He observed, that the facility with which the parenchymatous texture inflames, without early manifesting sufficiently important symptoms, explains the reason why pneumonia should often proceed to an irreparable extent, while the difficulty of establishing inflammatory action in the serous texture immediately gives rise to urgent symptoms.

Mr. Field first described the situation, connexions, texture, and functions of the pleuræ. He then spoke of the causes of pleurisy—external violence, puncture or laceration of the parietes of the chest, vicissitudes of temperature, exposure to cold after exertion, and previous disease of the lungs. Horses of spare but vigorous habits, at or beyond the adult age, were the principal subjects of attack from the second class of causes. Both sides usually simultaneously affected, although not equally so; or the disease might commence in one side, but proceed rapidly to the other. An experiment made by Hurtel D'Arboval was related; two drachms of super-oxalate of potash were injected into the cavity of the thorax; fifty hours afterwards the animal was destroyed, and inflammation, adhesion, and effusion were found in both of the thoracic cavities.

Pleurisy was divided into acute and chronic.

The symptoms of acute pleurisy in an early stage were, depressed appearance; hard, full, strong pulse, from 42 to 54; painful and limited respiration; inspiration quick, interrupted; expiration slow, prolonged; pressure on the sides painful, occasioning a peculiar grunt; convulsive twitchings of the panniculus carnosus; faint suppressed cough or sneeze, causing a trembling folded appearance of the integuments; neck extended; nose protruded; flexibility of motion impaired; tongue moist and clean; pituitary and conjunctival membranes of their natural hue.

As the disease proceeds, pulse more frequent, small, wiry; respiration accelerated; tongue furred; full inspiration; difficult and painful expiration; patches of sweat; pulse more indistinct, restlessness, delirium, death.

Symptoms of first stage continue from three to seven days, when the disease terminates fatally, or symptoms of the second stage commence. The contractions of the abdominal muscles diminish; belly drops; full inspiration; less painful expiration; convulsive twitching, less violent and less frequent; pulse distinct and soft, but quick; alternations of remission and exacerbation. In favourable cases, the quickness of pulse gradually diminishes; body regains its flexibility; appetite returns; the horse lies down; and in three or four weeks may be considered well, although unfit for work.

The *post-mortem* appearances are sometimes injection and deepened colour of the costal and diaphragmatic pleuræ, without effusion; sometimes the lateral pleuræ highly vascular, with numerous filaments from the inflamed surface, and patches of lymph, with a small quantity of serous purulent effusion.

In most cases a considerable collection of fluid, pale, or yellow, or reddish, or sanguineous, in all three cavities; or serous on one side, and sanguineous on the other; the lateral pleuræ thickly coated with lymph, and adhering to the pulmonary pleuræ; at times, stripes or patches of inflammation; occasionally one lung surrounded by a complete adventitious membrane; the lungs generally flaccid, less crepitant, and considerably compressed. From contiguity, the pericardium frequently vascular or coated with lymph, with effusion in its cavity.

He had had a few opportunities of inspecting the bodies of horses at distant periods after recovery from pleurisy. In some no morbid appearance could be detected; in others a broad band from one to three inches, with interposed blood vessels, extended between the pulmonary and costal pleuræ.

At an early period of the discussion, some gentlemen expressed a doubt as to the existence of pure pleurisy. One gentleman considered pleurisy as the consequence and proof of chronic inflammation of the parenchymatous substance of the lungs. It was replied, that the symptoms which characterised pleurisy were altogether different from those of chronic inflammation of the substance of the lungs.

The partial and local inflammation was denied. It was asserted, that inflammation of a serous membrane must be equally diffused through the whole of it. It was replied that facts were stubborn things, and that this confined extent of inflammation continually presented itself, and that the inflammation of the pulmonary pleuræ in spots was one characteristic morbid appearance of rabies.

It was said that Mr. Field had described inflammatory sore throat, and not pleurisy. It was asked of this objector, whether the twitchings of the panniculosus carnosus, and the tenderness and grunting on pressure, and freedom from injection in the schneiderian membrane, were symptoms of sore throat, and whether a pleuritic horse usually had enlargement of the glands and difficulty of swallowing.

A very satisfactory account was elicited from Mr. Field of the difference between the symptoms of pneumonia and pleuritis. The oppressed pulse of the one, the hard febrile pulse of the other; the difficult convulsive expiration of the one, the peculiar quick and painful inspiration and the prolonged expiration of the other; the intensely red hue of the conjunctival and pituitary membrane in the one, the slight degree of injection in the other; the freedom from pain or pressure in one, and evident pain expressed by the other; the healthy coldness of the extremities in the one, and the variable temperature in the other; the great prostration of strength in the one, the far less debility and the convulsive twitchings in the other; the obstinate standing to the last in the one, the frequent lying down and getting up in the other.

The discussion then took an irregular turn, and embraced the subject of fever. Some novel opinions were started, that local inflammation could not exist without previous affection of the larger vessels; and that fever was not to be considered so much as a disease, as merely one of the symptoms of disease. Returning to the proper subject, the use of auscultation was considered; although, in an early period of the disease, it afforded little or no assistance, yet, in the more advanced and dangerous stages, it enabled the practitioner to detect the existence and commencement of effusion.

On the whole, it was the opinion of the majority of the speakers, that pleuritis did occasionally exist in the horse as a distinct disease, and that it might be sufficiently distinguished from pneumonia, bronchitis, or cynanche tonsillaris.

(*Continued from previous page.*)

Professor LINTON returned thanks and said that he was always delighted to visit Aberdeen.

The meeting closed with a vote of thanks to Mr. Rice for his conduct in the Chair.

J. MCALLAN, *Hon. Secretary.*

During a whirlwind 700 sheep on a farm in the Orange Free State were picked up by the wind and nearly all killed, their mangled bodies being strewn over the ground when the whirlwind had passed.

NOTES AND NEWS.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

Oct. 14th—Meeting of the Editorial Committee, N.V.M.A., 10 Gray's Inn Square, London, at 4-30 p.m.

„ 17th—Meeting of the Lincolnshire and District Division, N.V.M.A., at Lincoln.

„ 18th—Meeting of the Mid-West and South Wales Division, N.V.M.A., at Cardiff.

„ 25th—Meeting of the Yorkshire Division, N.V.M.A., at Leeds.

Personal.

Appointments:—Mr. Allan Leslie, M.R.C.V.S., has been appointed Lecturer in Veterinary Biology at Lincoln Agricultural College, Canterbury, New Zealand.

Amongst the appointments made by the Secretary of State for the Colonies during the month of September was that of Mr. W. W. A. Taylor, M.R.C.V.S., as veterinary officer, Nigeria.

Mr. Trevor Spencer, M.R.C.V.S., of Kettering, has been appointed lecturer in veterinary science to the Moulton Farm Institute by the Northamptonshire Education Committee. He will also act as veterinary officer to the Moulton Farm Institute.

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Veterinary Research Scholarship.—Mr. Donald W. Menzies, M.R.C.V.S., Lewiston, who graduated at Glasgow Veterinary College in July, after a notable academic career, has been awarded a Veterinary Research Scholarship by the Department of Agriculture for Scotland, tenable at Cambridge University for three years.

County Veterinary Officer for Somerset.

Somerset County Agricultural Committee, meeting at Taunton on October 2nd, decided to appoint a county veterinary officer at a salary of £600 a year. The seriousness of animals' diseases was pointed out, and it was declared that a full-time officer was now necessary to co-ordinate the work of the part-time veterinary practitioners who had previously done the work under the Acts dealing with the diseases of animals.

The Diseases of Animals Sub-Committee reported that they had come to the definite conclusion that the administration by the local authority of the Diseases of Animals Acts and Orders, and particularly of the Tuberculosis Order, would be rendered more uniformly efficient, and co-ordinated to a greater extent with the performance of the County Council's duties under the Milk and Dairies Acts and Orders, by such an appointment.

They therefore recommended the County Council to sanction the appointment of a whole-time veterinary officer, not over 40 years of age, at a salary of £600 per annum, rising by annual increments of £25 to £700 per annum, together with travelling expenses according to the appropriate county scale, such officer to reside where directed by the committee, and to act under the general direction of the clerk of the Council.

Col. M. L. Blake, chairman of the committee, said that if the appointment was made the officer would deal with as many cases as possible, but it would still be necessary to employ outside veterinary practitioners on occasions. The officer would also carry out as many *post-mortem* examinations as possible.

The committee's recommendation was carried.

Prevalence of Johne's Disease.

"The Peterborough County Veterinary Inspector, Capt. W. K. Townson, M.R.C.V.S., in his report on the work carried out under the Milk and Dairies Order for the last quarter, states that Johne's disease is very prevalent in this district, resulting in many very poor animals being found in the dairies," says the *Peterborough Standard* of 20th September. "Though this disease is not scheduled under the acts, he had been able to advise dairymen in their own interests to get rid of these animals, as the condition is highly infectious and pastures are readily contaminated. He regrets that there still exists a great number of cases of abortion among the dairy herds. It is a matter of grave concern to the dairymen, and great financial loss. Many large dairies are affected. The bacillus may be found in milk samples, and the possibility of infection of the human female must not be lost sight of."

South African Veterinary Medical Association.

Mr. A. C. Kirkpatrick, M.R.C.V.S., Hon. Secretary of the South African V.M.A. forwards us an extract from the minutes of the annual general meeting, held on March 28th, 1929, which shows the following to have been elected as officers:—*President*, Dr. P. J. du Toit, Dr. Med. Vet.; *Treasurer*, Dr. J. Quinlan, M.R.C.V.S.; *Secretary*, A. C. Kirkpatrick, M.R.C.V.S., *Council*, Messrs. J. Chalmers, W. H. Chase, H. H. Curson, A. Goodall, G. de Kock, W. M. Power, E. M. Robinson, J. Spreull and P. R. Viljoen.

At a meeting of the Council held immediately after the ordinary meeting, Mr. J. Chalmers was unanimously elected Vice-President of the Association.

"Tortoiseshell Cat Mystery."

Mr. Henry Gray, in forwarding the following note which appeared under the above heading in a recent issue of the *Daily Sketch*, writes:—"I think this worthy of reproduction in the *Veterinary Record*, so as to attract attention to this zootechnical (eugenic) question. Probably some of the profession may be able to give some information from actual observation. I have seen very few tortoiseshell males and they were always sterile." The *Daily Sketch* writer states:—

"Lady (Claud) Alexander, who is an authority on cats and has a number of valuable tortoiseshells at her home at Fay Gate Wood, in Sussex, is endeavouring to solve the mysterious shortage of male tortoiseshells.

"During the past thirty years Lady Alexander has had only three real tortoiseshell males and five tortoiseshell and white males, which are equally rare.

"There is a danger of these beautiful creatures becoming extinct if the curious hereditary problem is not solved.

"Lady Claud tells me of a male tortoiseshell cat owned by the University of Liverpool. His offspring has been legion and yet not a single male kitten has been born to him.

"Several professors at the University are still trying to solve the mystery."

Epizootic Abortion: Midland Farmer Convicted.

A Midland farmer was recently convicted for exposing in a market a cow which had calved prematurely within the previous two months, and was fined £5 with £5 6s. 6d. costs. The proceedings were taken under the Ministry of Agriculture's Epizootic Abortion Order, which makes it an offence for any person to expose in any market a cow or heifer which to his knowledge, or according to information furnished to him, has calved prematurely within the previous two months, or to sell such an animal without giving the purchaser, before the sale, written notice of such premature calving. Similar written notice of premature calving is necessary in the case of a cow or heifer being sent to a bull for service. The object of the Order is to check the spread of the disease and to protect farmers against receiving animals which may be the means of introducing the disease into their herds.

Imports and Foot-and-Mouth Disease.

"The importation of oats from Germany," says the Agricultural Correspondence of *The Times*, "raises in a fresh form the question of imports generally from countries in which foot-and-mouth disease exists. If these imports are spread over the country, the risk of disseminating foot-and-mouth disease must be considerable. Danger attaches to vegetables and other articles that come into urban centres, especially as refuse often finds its way into the country or to suburban pig sties; but if oats from infected areas are distributed over the country and used as food for stock, the risk is greater. What would be the attitude of the Ministry of Agriculture towards the movement of oats, or other material, out of scheduled areas in this country into healthy districts? The analogy is justified concerning a disease so tenacious, elusive, and easily carried from one centre to another as foot-and-mouth disease."

CORRESPONDENCE.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.
All correspondence must bear the name and address of the contributor for publication.
The Editor does not hold himself responsible for the opinions of his correspondents

Animal Diseases Research Association.

To the Editor of The Veterinary Record.

Sir,—I have read with consternation the leading article of the *Scottish Farmer* of the 21st September, and Professor Gaiger's letter in connection therewith, with regard to the appointment of a successor to Mr. W. A. Pool, M.R.C.V.S., as Director of Research, Animal Diseases Research Association, Moredun Institute, Edinburgh. I think the time has come when there should be a little plain speaking and a clear understanding as to the position of the veterinary scientist in his own domain. If it is intended to put in a medical man into this appointment I, for one, consider that there should be, and must be, rebellion by the whole profession. We have submitted too long to the idea held in some quarters that the only persons competent to investigate animal disease, to be the considered authorities on animal genetics, animal physiology and animal nutrition, should be others than trained veterinarians. We do not pose as experts in matters of human disease; we stick to our legitimate sphere, and we expect members of the medical profession to respect this view and to leave veterinary appointments and essentially veterinary fields of labour to those whose special training befits them for it. It is only right, fair and honourable that it should be so. I am not privileged to know what lies behind the so-called "crisis," but this I do know, that it will be lamentable and disastrous to the interests of the stock-owning community of Scotland, and indeed beyond the confines of that country, if any other person than a trained veterinary surgeon and scientist, conversant with and experienced in all animal diseases, is made Director of Research at the Moredun Institute. It is inconceivable to any right-thinking and practically-minded person that those charged with the appointment of a successor to Mr. Pool should hesitate for one moment as to the profession which is more calculated than any other to handle animal disease and animal affairs. Yours faithfully, J. Moore, Maj.-Genl.

16 Frognal Lane, Hampstead, N.W.3.
7th October, 1929.

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To the Editor of The Veterinary Record.

Sir,—It is with considerable astonishment that I learn of the contemplated appointment of a medical man as Director of the A.D.R.A. in the place of Mr. Pool, M.R.C.V.S., who recently retired. It is inconceivable that any man, or body of men, having the power to make such appointments, should contemplate for one moment the substitution of a medical man for a veterinarian to a position of control in the investigation of purely-animal diseases.

Has it not been abundantly proved, in recent years, that the veterinary profession is well able to furnish highly-trained scientists in numbers sufficient to meet all demands? And can it any longer be denied that he who spends his life in research into diseases of the lower animals, is the one who (by his very training) is best qualified to direct the activities of such an institution as the A.D.R.A.?

No member of the Royal College of Veterinary Surgeons would, I am sure, ever be so egoistical as to suggest that co-operation with medical scientists would not prove of inestimable value to the cause being pursued; but our associations with them should end at "co-operation," and they should not be permitted to usurp a position which is eminently veterinary in nature.

I shall be greatly surprised if the veterinary surgeons and farmers of this country, and their supporters, do not rise unitedly in justifiable anger and protest against such an ill-advised and short-sighted scheme as the one in contemplation.—Yours faithfully,

Hamilton Kirk, Major, R.A.C.V., T.A.
Croyland, Finchley Road, N.W.11.
8th October, 1929.

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To the Editor of the Veterinary Record.

Sir,—Your issue of September 28th, 1929, contains references to the possibility that a person other than a veterinarian may be appointed to the vacancy created at the Moredun Institute, Edinburgh, by the resignation of Mr. W. A. Pool. As stated in the leading article reprinted from *The Scotsman* and as emphasised by Prof. Gaiger in his letter on the subject, such a possibility is a matter for grave concern to the agricultural community and is naturally calculated to cause resentment among members of the veterinary profession. It is not possible in a letter of reasonable length to deal in detail with all the points at issue, but there are two aspects of the case to which I desire to draw attention.

In the first place it is evident that an Institute which is charged with the task of investigating the diseases of farm animals must extend its activities sooner or later to the field where laboratory results can be tested under practical conditions. As the writer of the leading article in *The Scotsman* says, "The essence of success in research into animal diseases lies in securing the co-operation of stock owners and their employees"—and I would add that a by no means unimportant factor is to secure the co-operation of veterinary practitioners. For the successful prosecution of this final and crucial phase of the Institute's work it is not sufficient merely to select an owner who appears to be suitable and to obtain his permission that the proposed experiments may be conducted on his animals. It is a matter of the first importance that the confidence and interest of the owner should be maintained throughout the whole course of the experiments which from their nature are usually of long duration. Anyone who has had experience of such work is aware how difficult it is at times even under the most promising circumstances to maintain this interest and to have a reasonable assurance that the experiments are proceeding according to plan. I think it will not be denied that the duty of maintaining contact with stock-owners and of sustaining their interest in this way should be one of the primary concerns of the Director of the Institute. In my view this responsibility should not be allowed to weigh upon the shoulders of other members of the professional staff, whose main duty it will be to carry out the actual work. Unless the Director by virtue of his calling possesses at least a fair knowledge of farm stock and their general management it is obvious that he will be considerably handicapped in his efforts to secure satisfactory co-operation with owners and with their less enlightened employees. Should he fail in his efforts in this respect any results obtained would tend to be suggestive only and would be unlikely to provide the clear proof from which alone stable conclusions may be drawn.

The second point which I wish to emphasise is that of the manifest unfairness to veterinary research workers of a proposal to place a person without veterinary qualifications in charge of an Institute of Animal Pathology. Such unfair treatment would perhaps be justified if it could be shown that the interests of the stockowner, which are of

course the primary consideration, would be less adequately served by direction from a member of the veterinary profession than from a member of an allied profession. Prof. Gaiger has dealt with this point fully in his letter and it is sufficient to re-affirm here that the correctness of such a suggestion could not be seriously defended. Now although at the present time there is a shortage of men of real promise who have a taste for research in animal diseases, no one with a knowledge of the facts will deny that there are available veterinary research workers who would be capable of directing the activities of the Moredun Institute, even though it should be decided to widen its scope. At present the higher positions available for research men in the veterinary sphere are few enough. If the present proposals come to maturity, however, it has to be assumed that scientific workers with veterinary qualifications who may desire to improve their positions will be debarred from the opportunity of applying for the vacancy at Edinburgh. Is it not unfair in the extreme to the existing worker, as well as discouraging to the veterinary graduate who wishes to take up research as a career, to feel that one of the few higher positions available may be entrusted to a person who is not a veterinarian ? Such a proposal if allowed to materialise can only tend to impoverish still further the one field of agricultural activity in which workers are all too few.

Yours faithfully,

F. C. MINETT,

Director, Research Institute in Animal Pathology.
Royal Veterinary College, London.
October 5th, 1929.

"Chronic Bovine Pneumonia."

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—I was interested in reading the article by Mr. R. H. Smythe, M.R.C.V.S. *re* the above in the issue of the *Veterinary Record* of October 5th.

I think the disease he describes so well is what is known by continental observers and recognised by some men here as "Interstitial Emphysema of the Lungs." The complaint in the horse has had much attention given to it; cattle have been overlooked in this connection and yet in many respects the conditions under which they exist would seem to favour the more frequent occurrence of the malady in them than in the case of the equine. Chronic catarrh, long housing in the cowshed, non-exercise of the lungs, chills from the mist in undulating land, parasitic bronchitis, smoke and chemical vapours from works and factory chimneys are all predisposing factors.

Here, in industrial Lancashire, probably half the population of some towns suffer from catarrh and emphysema. Perhaps in some cases in cattle the herbage may be an originating cause—(Is it too far fetched to suppose that certain individual cattle are susceptible to a complaint analogous to hay fever ?).

The increased volume of the lungs, their puffy appearance and parts of different size filled with air, are frequently discernible on *post-mortem*.

Heart weakness and coughing are often prominent features of the complaint and in some cases of this nature it is feasible that the origin of Thurow's disease (which I have seen and treated three or four times and which is characterised by the distension of the subcutaneous tissues with gas) arises from lung emphysema. Now and again there may be emphysema of thorax and neck. (I would like to read Mr. Smythe's views on Thurow's disease,which few practitioners have described.)

Treatment of the complaint is useless in most cases, but warmth to the thorax, the best air that can be got and arsenical preparations hypodermically or in linseed oil over the food may be tried if desired by the practitioner.—

Yours faithfully, G. MAYALL,

Bolton.

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TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—Mr. R. H. Smythe, M.R.C.V.S., Camborne, in last week's issue of the *Veterinary Record*, describes cases of the above condition.

There may be a possibility that the disease he describes is a bovi-septicus infection, and the following articles are of value in that line of investigation.

Journal of Experimental Medicine, Vol. xxxiv, pp. 561—577.
Veterinary Record, Vol. viii, p. 235.
Veterinary Record, Vol. ix, p. 554.
Veterinary Journal, Vol. 85, No. 2, p. 75.

Yours faithfully, WILLIAM TWEED.

Sheffield,
5th October, 1929.

"Potato Poisoning."

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—In your issue of October 5th, Mr. Wilson writes under the heading of "Potato Poisoning." The symptoms he describes, however, with the exception of swelling of the legs, which I have not observed, appear to me to be simply those of indigestion due to over-eating potatoes. He says the condition is easily righted. In true potato poisoning, *i.e.*, where poisoning is due to solanin, which is contained in unripe and green, or in old, rotten or sprouting potatoes; the condition, in my experience, has been a very serious and fatal one. Personally, in the few outbreaks I have encountered, I have been powerless to avert a fatal termination.

I have sent to the *Record*, this week, an account of one outbreak of what I believe to have been potato poisoning in horses. I did this because the literature on the subject is not very helpful, as the accounts of the symptoms, recorded by different observers, vary so much.

I have also had outbreaks in cattle, and the symptoms have been similar to those I have described in the horse, the termination also being a fatal one.

It was in the hope of learning some method of treatment that I sent in the article. I have tried all ordinary means without success.—Yours faithfully, W. A. DICKINSON.

Crowland, Peterboro.
5th October, 1929.

[Mr. Dickinson's article will appear in next Saturday's issue of the *Record*.—Ed..]

"The Psychic Factor in Canine Hysteria."

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—Just after reading the letter of your correspondent E. Gertrude Knight, I came across an article in the *Review of Reviews* on Psycho-analysis, by Arthur Lynch. I can recommend it to her before she puts her faith in Freud as a consultant in canine hysteria. Besides, potassium bromide, chloral, luminal and other sedative drugs combined with hygiene and correct handling do wonders.

I cannot think that hysteria is so new as we are led to believe. Civilisation is certainly not new, nor is it brief, nor can limits be assigned to it. No doubt there were hysterical beings in the Chinese civilisation of centuries ago. I would go as far as to say that there were such cases in the time of those strong silent men, the cave men.

The treatment was doubtless very efficacious, carried out by means of a club or similar depressing instrument. But I should think that a neurotic mammoth would have been beyond even this treatment.

As far as I can make out we have not progressed any further in the study of the mind and the emotions than the old philosophers Socrates, Aristotle and others. Shakespeare, too, was quite conversant with these matters. Nor must we forget the Bible, where we get historical accounts of cases certainly simulating hysteria. Another book of great value in this connection is that of Mrs. Beeton who, though she does, or did, not pretend to be a psychologist, has for years upheld the principle "*Mens sana in corpore sano*."

Yours truly, BERNARD GORTON.

Bournemouth,
7th October, 1929.

The Editor acknowledges the receipt of the following:—

Communication from Capt. A. W. Noel Pillers (Liverpool).

Report of a meeting of the North of England Division from Capt. J. R. Rider, Hon. Sec.